United States Department of Agriculture

Natural Resources Conservation Service

Arizona Basin Outlook Report March 15, 2004

Basin Outlook Reports and Federal - State - Private Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation and streamflow values are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

Issued by

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ARIZONA
Water Supply Outlook Report
as of March 15, 2004

A full range of Snow Survey and Water Supply Forecasting products is available on the Arizona NRCS Home Page

Snow Survey Program
http://www.az.nrcs.usda.gov/snow/index.html

Helpful Internet Sites

Defending Against Drought – NRCS
http://www.nrcs.usda.gov/feature/highlights/drought.html

- **Ideas on water, land, and crop management for you to consider while creating your drought plan.**

Arizona Agri-Weekly
http://www.nass.usda.gov/az/cur-agwk.pdf

- **Provides an overview of Arizona's crop, livestock, range and pasture conditions as reported by local staffs of the USDA's Agricultural Statistic Service and University of Arizona, College of Agriculture.**

SUMMARY

The water supply outlook for Arizona has not improved since the last report. In that regard, data collected from high elevation NRCS SNOTEL sites show that seasonal precipitation catch for the period October-March 15 is well below normal and the current statewide snowpack was measured at 71 % of the long-term average. As a result, water users can expect short water supplies this season.

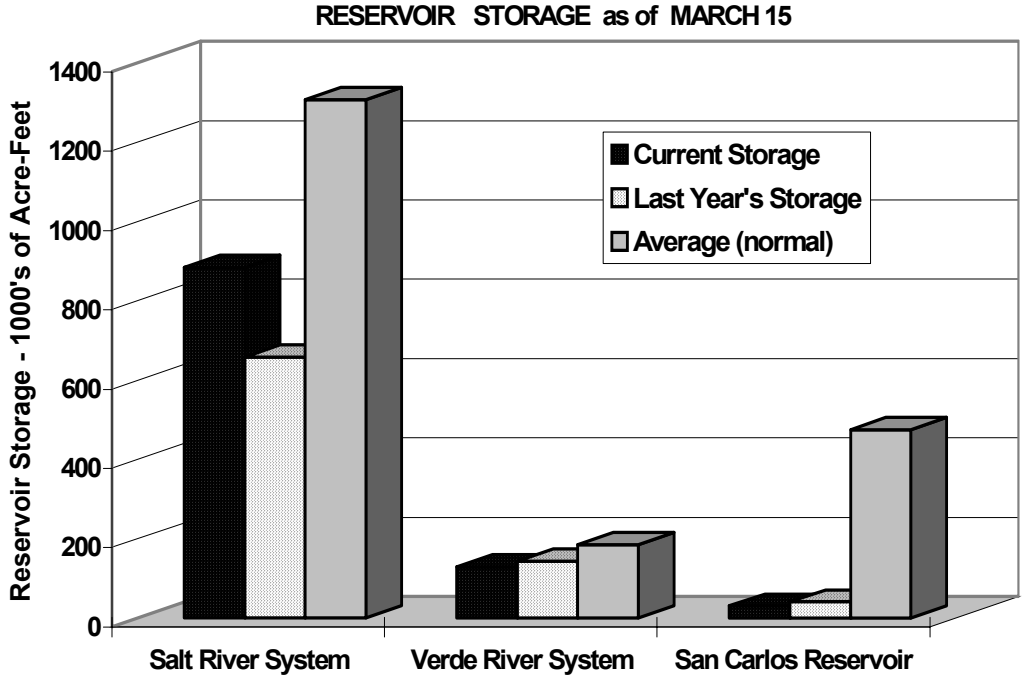
SNOWPACK

Watershed	Percent (%) of 30-Yr. Average Snowpack Levels as of March 15
Salt River Basin	72%
Verde River Basin	59%
Little Colorado River Basin	58%
San Francisco-Upper Gila River Basin	78%
Other Points of Interest	
Chuska Mountains	91%
Central Mogollon Rim	47%
Grand Canyon	67%
San Francisco Peaks	69%
Statewide Snowpack	71%

PRECIPITATION

Mountain data, from NRCS SNOTEL sites, show abundant precipitation catch for the period March 1-15. In that regard, total precipitation catch for the month of March will be illustrated in the next report, which will be the final issue for the 2004 season.

RESERVOIR



Key storage volumes displayed in thousands of acre-feet (1000 x):

RESERVOIR	CURRENT STORAGE	LAST YEAR STORAGE	30-YEAR AVERAGE
Lyman Lake	2.6	2.4	16.2
Show Low Lake	3.5	2.8	3.6
Lake Pleasant	704.4	630.3	----
Lake Havasu	550.7	546.6	552.6
Lake Mohave	1701.5	1684.5	1694.0
Lake Mead	15371.0	16971.0	22090.0
Lake Powell	10340.0	12620.0	18366.0
Salt River System	883.9	658.0	1306.3
Verde River System	128.5	142.4	184.4
San Carlos Reservoir	29.8	40.4	474.9

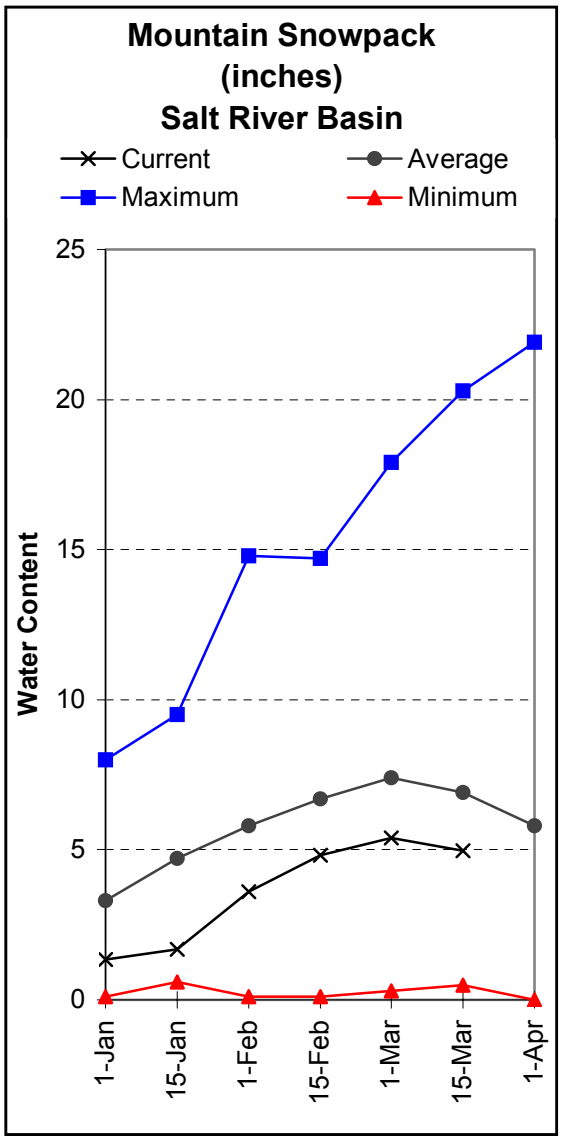
STREAMFLOW

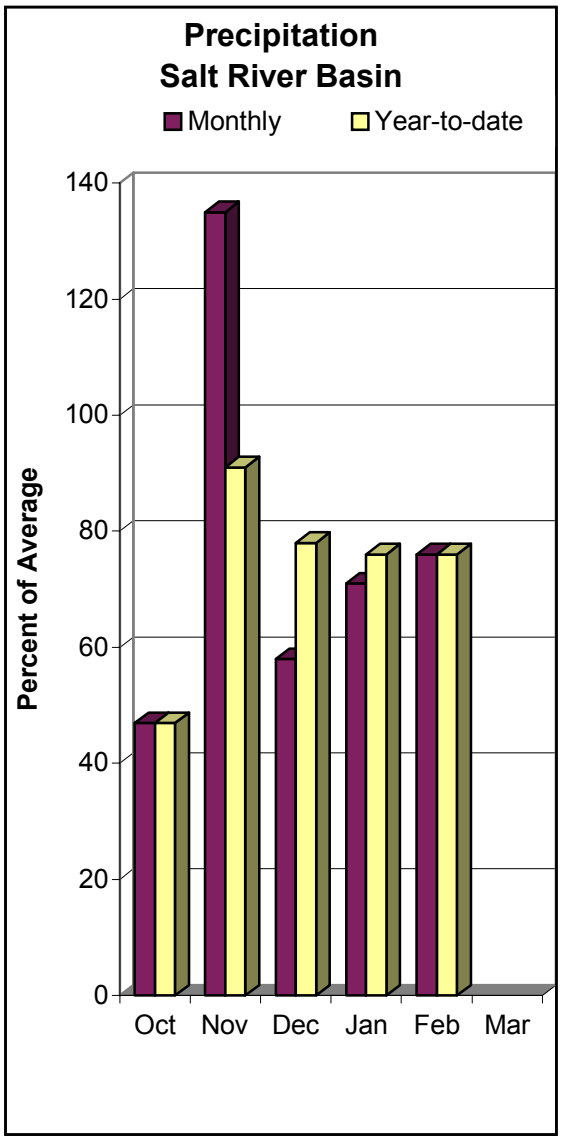
Well below median runoff levels are predicted for all major rivers and streams in Arizona. Please refer to the forecast tables provided in this report for more information regarding seasonal water supplies.

SALT RIVER BASIN as of March 15, 2004

Well below median streamflow levels are forecast for the basin. In the Salt River, near Roosevelt, the forecast calls for 42 % of median streamflow levels through MAY, while in Tonto Creek, the forecast calls for 21 % of median streamflow levels through MAY.

Furthermore, snow survey measurements show the Salt snowpack to be 72 % of the 30-year average, while combined reservoir storage in the Salt River system is reported to be at 883,966 acre-feet.





SALT RIVER BASIN
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (Most Prob) (1000AF) (% MED.)	30% (1000AF)	=== Wetter ===> 10% (1000AF)	30 Yr Med (1000AF)
Salt River nr Roosevelt						
MAR15-MAY	52	76	95 (42)	117	157	225
MARCH	23	43	56 (43)	69	89	131
Tonto Creek ab Gun Creek nr Roosevelt						
MAR15-MAY	0.3	1.6	3.5 (21)	6.5	13.5	16.6
MARCH	2.5	2.8	3.3 (20)	12.8	26	16.9

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

The average and median are computed for the 1971-2000 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
(2) - The value is natural volume - actual volume may be affected by upstream water management.

SALT RIVER BASIN
Reservoir Storage (1000AF) Mid-March

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
SALT RIVER RES SYSTEM	2025.8	883.9	658.0	1306.3

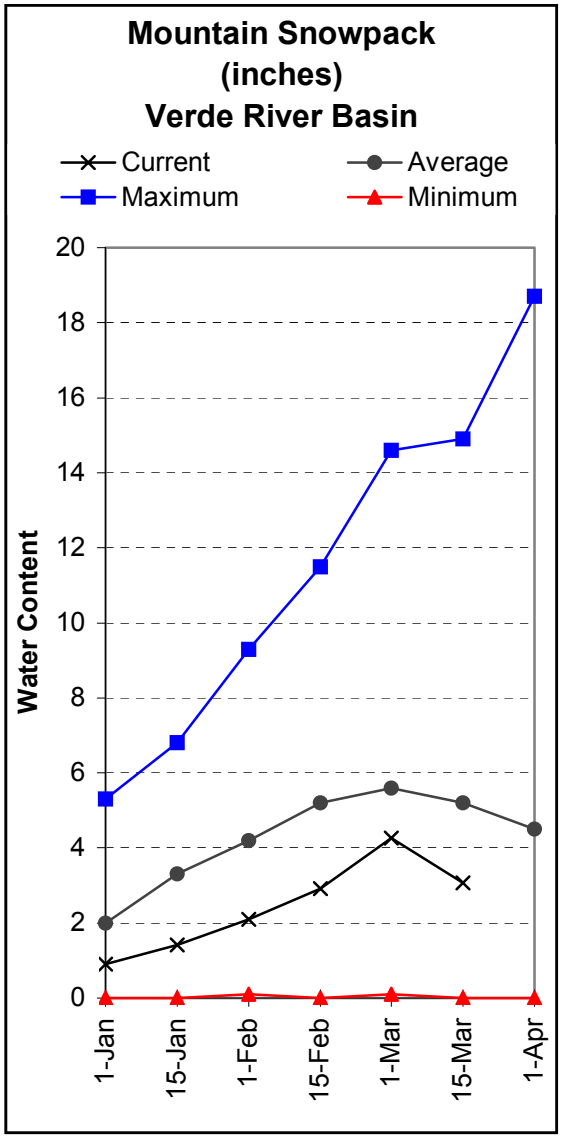
SALT RIVER BASIN
Watershed Snowpack Analysis - March 15, 2004

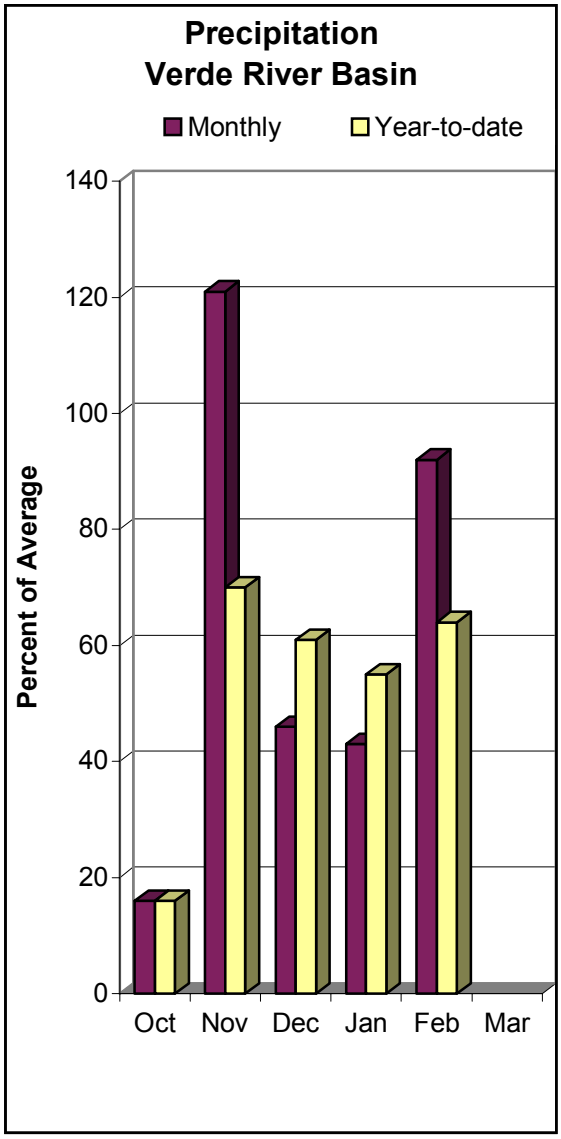
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
SALT RIVER BASIN	8	100	72

VERDE RIVER BASIN as of March 15, 2004

Well below median streamflow levels are forecast for the basin. In the Verde River, at Horseshoe Dam, the forecast calls for 50 % of median streamflow levels through MAY.

Additionally, snow survey measurements show the Verde snowpack to be 59 % of the 30-year average, while combined reservoir storage in the Verde River system is reported to be at 128,511 acre-feet.





VERDE RIVER BASIN
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === Future Conditions === Wetter ===> Chance of Exceeding * 90% (1000AF)	70% (1000AF)	50% (Most Prob) (1000AF)	50% (Most Prob) (% MED.)	30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Verde River abv Horseshoe Dam							
MAR15-MAY	18.0	35	50	50	69	106	100
MARCH	23	26	42	84	58	81	50

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.

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VERDE RIVER BASIN
Reservoir Storage (1000AF) Mid-March

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
VERDE RIVER RES SYSTEM	287.4	128.5	142.4	184.4

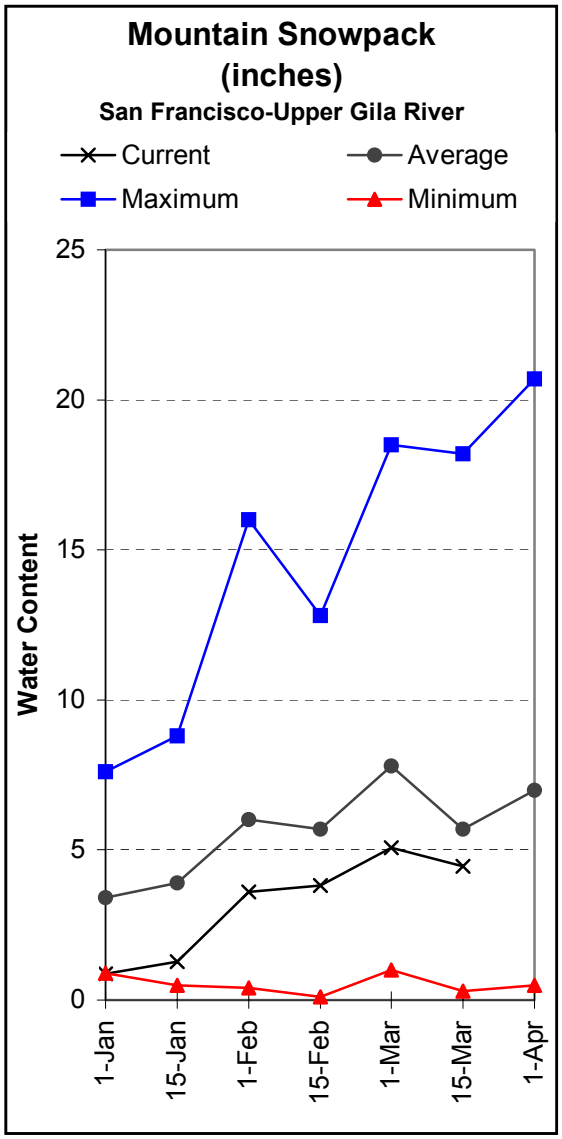
VERDE RIVER BASIN
Watershed Snowpack Analysis - March 15, 2004

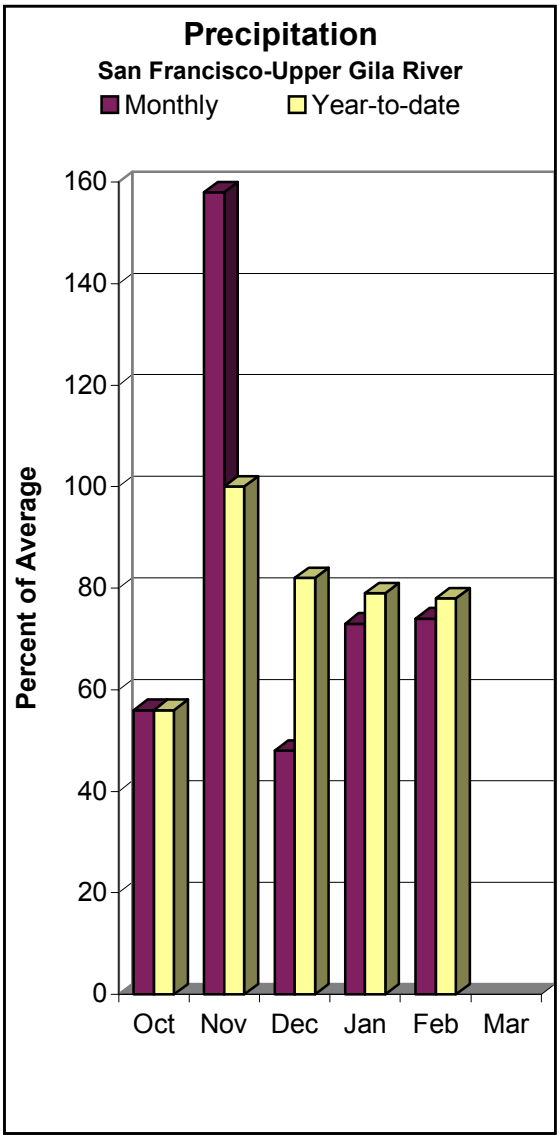
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
VERDE RIVER BASIN	10	145	59
SAN FRANCISCO PEAKS	3	92	69

SAN FRANCISCO-UPPER GILA RIVER BASIN as of March 15, 2004

Well below median streamflow levels are forecast for the basin. In the San Francisco River, at Clifton, the forecast calls for 64 % of median streamflow levels through MAY, while in the Gila River, near Solomon, the forecast calls for 41 % of median streamflow levels through MAY. At San Carlos Reservoir, inflow into the lake is forecast at 29 % of median through MAY.

At San Carlos, reservoir storage stands at 29,820 acre-feet, while snow survey measurements show snowpack levels to be at 78 % of the 30-year average.





SAN FRANCISCO - UPPER GILA RIVER BASIN
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — Chance of Exceeding * — 50% (Most Prob) (1000AF)	50% (Most Prob) (% MED.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Gila River at Gila							
MAR15-MAY	10.9	14.8	18.0	72	22	28	25
Gila River nr Virden							
MAR15-MAY	3.2	10.0	21	66	32	48	32
San Francisco River at Glenwood							
MAR15-MAY	3.5	5.9	8.0	65	10.6	15.2	12.3
San Francisco River at Clifton							
MAR15-MAY	3.0	7.5	19.1	64	31	48	30
Gila River nr Solomon							
MAR15-MAY	5.1	13.1	30	41	58	100	73
MARCH			25	47			53
San Carlos Reservoir inflow							
MAR15-MAY	2.4	6.2	13.9	29	32	57	48

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual volume will exceed the volumes in the table.
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SAN FRANCISCO - UPPER GILA RIVER BASIN
Reservoir Storage (1000AF) Mid-March

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
SAN CARLOS	875.0	29.8	40.4	474.9
PAINTED ROCK DAM	2492.0	0.0	0.0	288.1

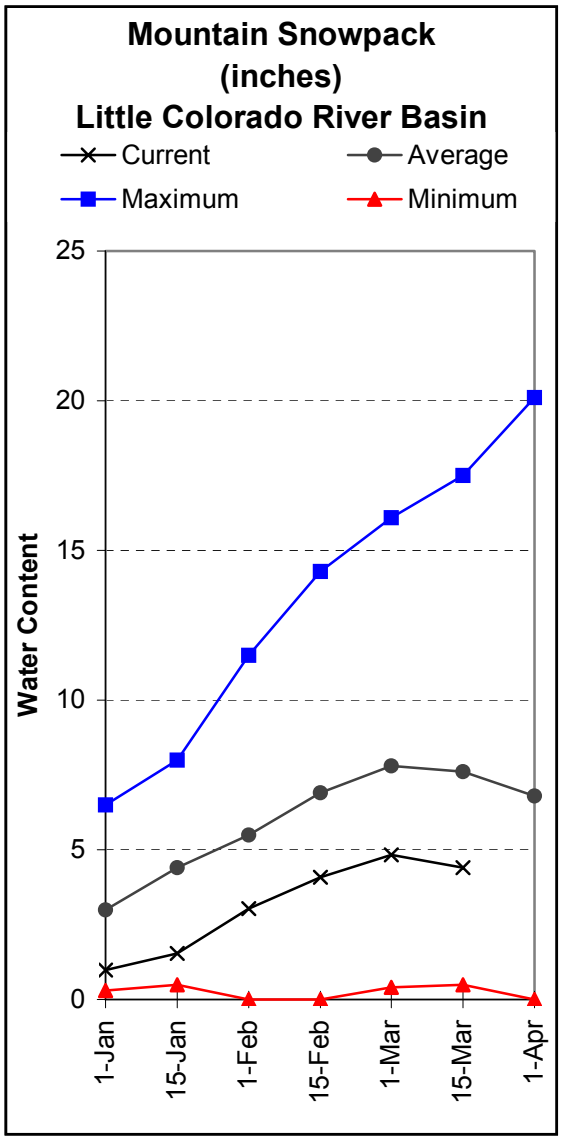
SAN FRANCISCO - UPPER GILA RIVER BASIN
Watershed Snowpack Analysis - March 15, 2004

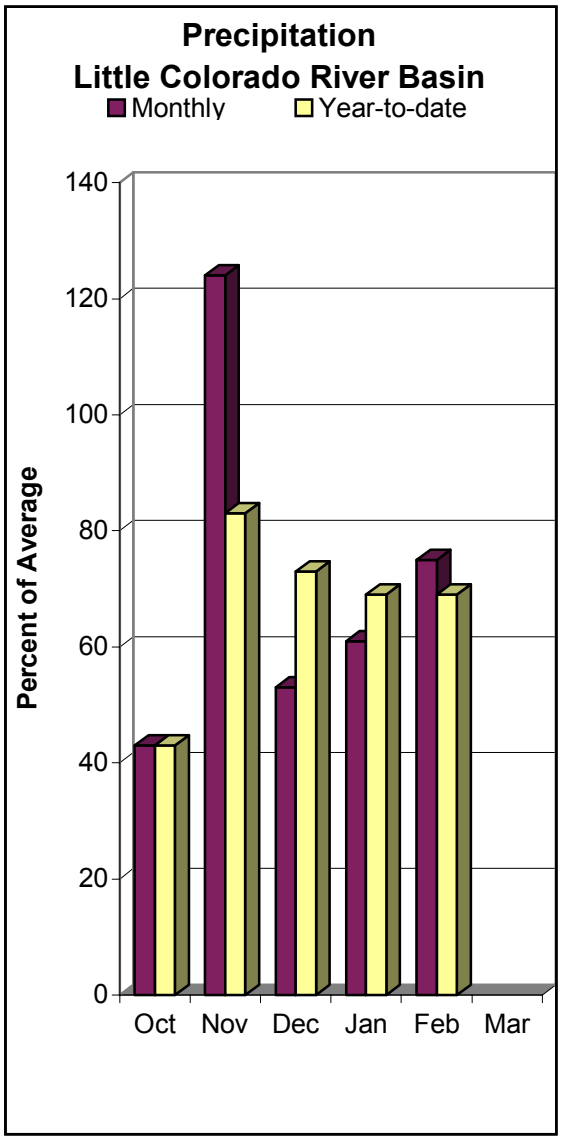
Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
SAN FRANCISCO - UPPER GILA R	9	120	78

LITTLE COLORADO RIVER BASIN as of March 15, 2004

Well below median streamflow levels are forecast for the basin. In the Little Colorado River, at Lyman Lake, the forecast calls for 38 % of median streamflow levels through JUNE, while at Woodruff, the forecast calls for 18 % of median streamflow levels through MAY.

Additionally, snowpack levels at the southern headwaters of the Little Colorado River and along the central Mogollon Rim were measured at 58 % and 47 % of the 30-year average, respectively.





LITTLE COLORADO RIVER BASIN
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions: 50% (Most Prob) (1000AF)	(% MED.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Med (1000AF)
Little Colorado River abv Lyman Lake							
MAR-JUN	0.65	1.51	2.40	38	3.58	5.95	6.30
Little Colorado River at Woodruff							
MAR-MAY	0.11	0.22	0.40	18	1.46	3.00	2.20
Blue Ridge Reservoir inflow							
MAR-MAY	1.9	3.5	4.8	38	6.4	9.1	12.8
Lake Mary inflow							
MAR-MAY	0.42	0.91	1.40	34	2.04	3.29	4.10

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LITTLE COLORADO RIVER BASIN
Reservoir Storage (1000AF) Mid-March

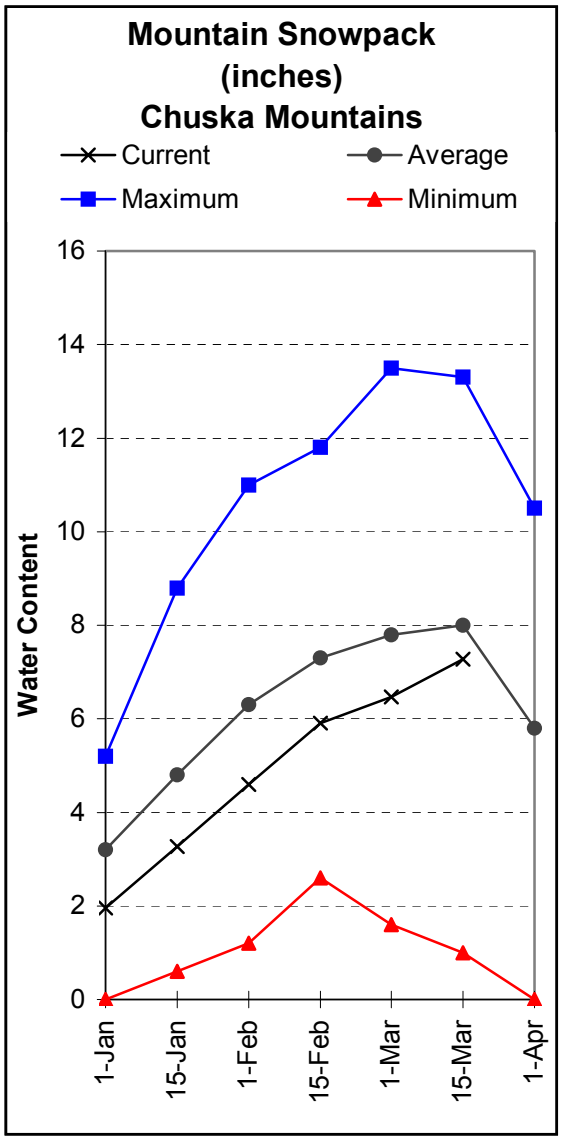
Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
LYMAN RESERVOIR	30.0	2.6	2.4	16.2
SHOW LOW LAKE	5.1	3.5	2.8	3.6

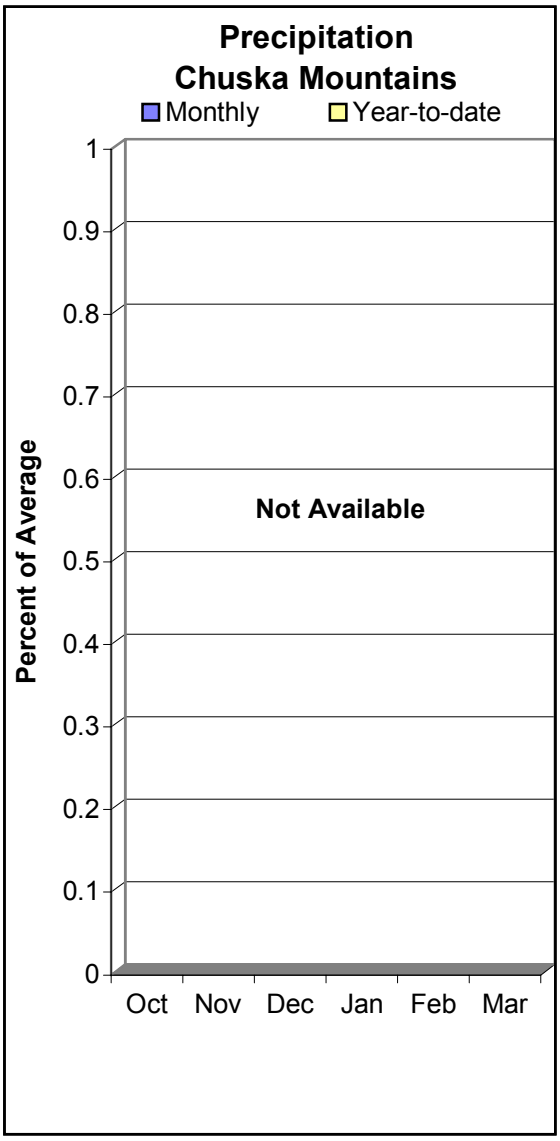
LITTLE COLORADO RIVER BASIN
Watershed Snowpack Analysis - March 15, 2004

Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
LITTLE COLORADO - SOUTHERN H	9	82	58
CENTRAL MOGOLLON RIM	4	74	47

CHUSKA MOUNTAINS as of March 15, 2004

Snow survey measurements conducted by staff of the Navajo Tribe show the Chuska snowpack to be 91 % of average, while well below average streamflow levels are forecast for Captain Tom Wash, Wheatfields Creek, and Bowl Canyon Creek, through springtime.





CHUSKA MOUNTAINS
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions 50% (Most Prob) (1000AF)	(% AVG.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Avg (1000AF)
Captain Tom Wash nr Two Gray Hills							
MAR-MAY	0.14	0.57	1.50	53	2.80	4.60	2.83
Wheatfields Creek nr Wheatfields							
MAR-MAY	0.14	0.58	1.54	53	2.84	4.74	2.90
Bowl Canyon Creek abv Assayi Lake							
MAR-MAY	0.07	0.20	0.53	53	0.98	1.64	1.00

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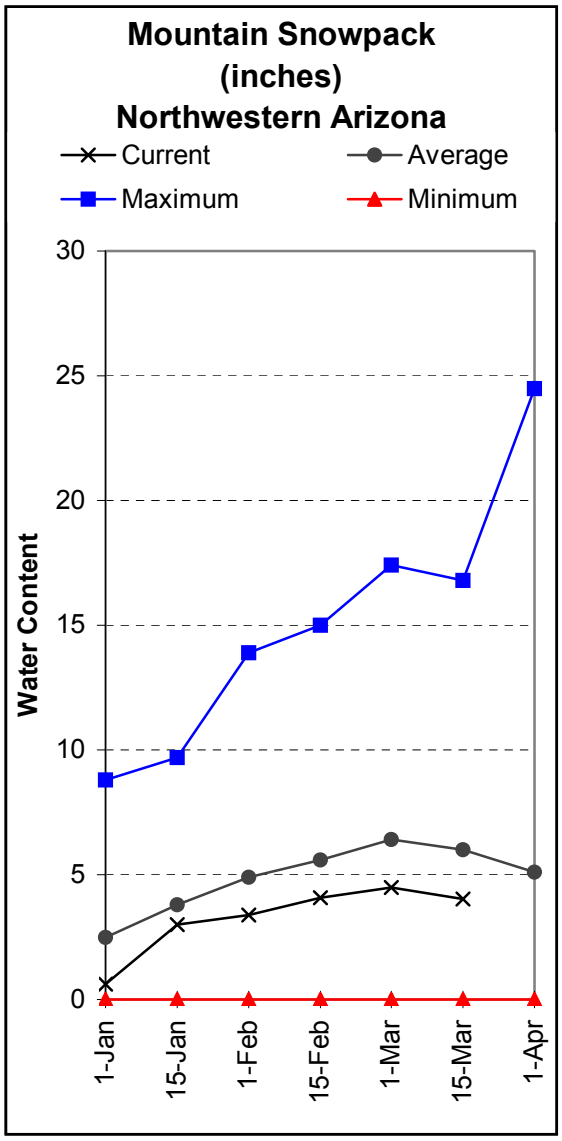
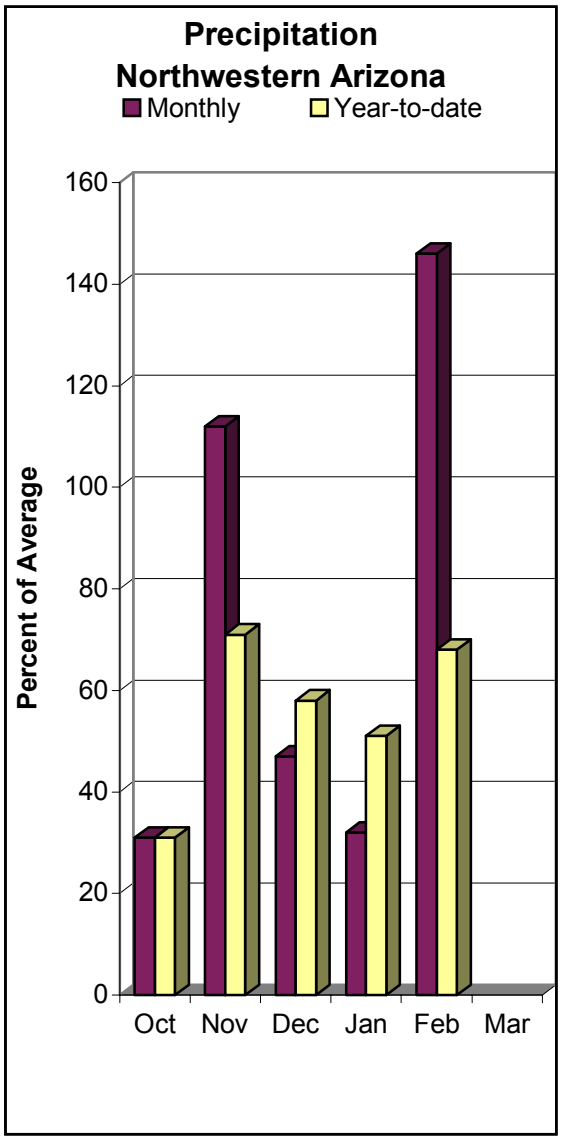
CHUSKA MOUNTAINS
Watershed Snowpack Analysis - March 15, 2004

Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
CHUSKA MOUNTAINS	7	91	91
DEFIANCE PLATEAU	2	192	117

NORTHWESTERN ARIZONA as of March 15, 2004

At Lake Powell, on the Colorado River, inflow into the reservoir is forecast at 74 % of the long-term average through JULY, while at the Grand Canyon, snow measurements conducted by staff of the National Park Service show the snowpack to be 67 % of the 30-year average.





NORTHWESTERN ARIZONA
Streamflow Forecasts - March 15, 2004

Forecast Pt / Forecast Period	<=== Drier === 90% (1000AF)	70% (1000AF)	Future Conditions — 50% (Most Prob) (1000AF)	(% AVG.)	=== Wetter ===> 30% (1000AF)	10% (1000AF)	30 Yr Avg (1000AF)
Lake Powell inflow							
APR-JUL	3538	4944	5900	74	6854	8259	7930

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NORTHWESTERN ARIZONA
Reservoir Storage (1000AF) Mid-March

Reservoir	Usable Capacity	********** Usable Storage ********* This Year	Last Year	Average
LAKE HAVASU	619.0	550.7	546.6	552.6
LAKE MOHAVE	1810.0	1701.5	1684.5	1694.0
LAKE MEAD	26159.0	15371.0	16971.0	22090.0
LAKE POWELL	24322.0	10340.0	12620.0	18366.0

NORTHWESTERN ARIZONA
Watershed Snowpack Analysis - March 15, 2004

Watershed	Number of Data Sites	This Year as Percent of Last Year	Average
GRAND CANYON	2	135	67

S N O W S U R V E Y D A T A

MARCH 15, 2004

SNOW COURSE	ELEV.	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 71-00
ARBABS FOREST (AK)	7680	3/11	3	1.0	0.0	1.3
BAKER BUTTE SNOTEL	7330	3/15	-	1.0	2.8	5.6
BAKER BUTTE #2	7700	3/11	23	8.7	8.3	13.7
BALDY SNOTEL	9220	3/15	-	6.9	7.4	8.1
BEAVER HEAD	8000	3/12	7	2.5	1.4	2.1
BEAVER HEAD SNOTEL	7990	3/15	-	4.0	3.5	2.6
BEAVER SPRING	9220	3/11	28	8.6	8.8	9.9
BRIGHT ANGEL	8400	3/11	26	8.4	6.2	11.3
BUCK SPRING	7400	3/10	3	0.9	0.7	3.1
CHALENDER	7100	3/15	0	0.0	0.0	2.8
CHEESE SPRINGS	8600	3/11	19	4.8	6.0	5.8
CORONADO TRL SNOTEL	8400	3/15	-	0.5	0.0	2.2
CORONADO TRAIL	8400	3/12	0	0.0	1.0	2.3
FLUTED ROCK	7800	3/11	13	3.8	2.5	2.8
FORT APACHE	9160	3/11	26	6.7	7.8	8.1
FORT VALLEY	7350	3/12	1	0.3	0.4	1.9
FRY SNOTEL	7220	3/15	-	4.3	0.9	5.5
GRAND CANYON	7500	3/15	0	0.0	0.0	1.3
HANNAGAN MDWS SNOTEL	9020	3/15	-	10.1	9.0	12.3
HAPPY JACK	7630	3/09	10	3.0	2.8	4.4
HAPPY JACK SNOTEL	7630	3/15	-	4.2	3.8	6.3
HEBER SNOTEL	7640	3/15	-	0.3	0.7	4.1
LAKE MARY	6970	3/11	1	0.5	0.0	1.4
MAVERICK FORK SNOTEL	9200	3/15	-	7.5	7.8	9.5
MORMON MTN SNOTEL	7500	3/15	-	5.8	2.0	6.4
MORMON MT. SUMMIT #2	8470	3/11	33	11.5	8.3	15.0
NEWMAN PARK	6750	3/12	1	0.9	0.9	1.2
NUTRIOSO	8500	3/12	0	0.0	1.0	1.2
PROMONTORY SNOTEL	7900	3/15	-	6.9	11.1	12.9
SNOW BOWL #1 ALT.	10260	3/11	28	8.2	9.0	16.1
SNOW BOWL #2	11000	3/11	39	11.2	13.2	20.5
SNOWSLIDE CYN SNTL	9750	3/15	-	15.3	15.5	13.5
TSAILE CANYON #1	8160	3/09	25	6.5	6.9	6.2
TSAILE CANYON #3	8920	3/09	31	9.3	11.2	9.5
WHITE HORSE SNOTEL	7180	3/15	-	0.6	1.3	4.6
WILDCAT SNOTEL	7850	3/15	-	2.6	1.6	3.7
WILLIAMS SKI RUN	7720	3/15	19	6.3	3.7	9.9
WORKMAN CREEK SNOTEL	6900	3/15	-	0.7	2.7	4.2